

FEB 28 2018

REPORT OF
RADIO FREQUENCY ENGINEER

PLANNING BOARD
GRAFTON, MA

The undersigned hereby states the following in support of the application by T-Mobile Northeast LLC ("*T-Mobile*" or "*Applicant*") to install a 70' above ground level (hereafter "AGL") wireless communications facility (the "Facility") on the existing water tank, install nine (9) panel antennas and (1) dish antenna at the 65' AGL antenna centerline mark on the existing water tank, together with related amplifiers, cables, fiber and other associated antenna equipment, including remote radio heads, surge arrestors, and global positioning system antennas with associated electronic equipment, and other appurtenances located on the ground adjacent to the water tank located at 29 Leland Hill Road, Grafton, Massachusetts (the "Site").

1. I am a Radio Frequency Engineer employed by T-Mobile, with an office located at 15 Commerce Way, Suite B, Norton, Massachusetts. Attached is a copy of my qualifications.
2. My primary responsibilities include radio frequency design and planning in the Commonwealth of Massachusetts, including the Town of Grafton and surrounding communities.
3. As enabled under its Federal Communications Commission ("FCC") License, T-Mobile seeks to design its wireless network to provide reliable and adequate wireless services to its customers, whether those customers are on the street, in a vehicle, or in a building. Providing reliable and adequate service to its customers in each context is critical for T-Mobile to provide the quality of wireless service that customers demand, and to meet the objectives of Congress that a robust, competitive and low cost wireless communications capacity be developed to serve the entire nation. T-Mobile's FCC licenses allow it to operate on the following frequencies: Tx: 728-734 MHz; 1930-1990 MHz; 2110-2155 MHz / Rx: 698-706 MHz; 1710-1755 MHz; 1805-1910 MHz. This will be a Personal Communications Service (PCS).
4. T-Mobile is also designing its network to provide enhanced high-speed data services commonly referred to as LTE - "long term evolution" service. LTE will be incorporated into this Facility.
5. T-Mobile is using its best efforts, to the maximum extent possible, to install its wireless communications services facilities network utilizing existing structures to avoid the need to construct new towers. Such is the case here where we have identified an existing water tank in a permitted zoning district.
6. I have thoroughly reviewed the radio frequency engineering studies, reports and computer models prepared by T-Mobile with respect to the Facility.
7. In order to build out its network and meet customer demand for voice and data services, as well as enhance its network to improve high speed data services, T-Mobile must have in place a system of low power 'cell sites' to serve mobile devices. A typical cell site, such as the one proposed, consists of antennas mounted to a building, tower, water tank or other structure. The antennas are connected to radio operating equipment housed at or near the structure.
8. To maintain effective, reliable and uninterrupted service, there must be a continuous series of cell sites located within close proximity to each other so as to overlap in a system comparable to a honeycomb pattern. If there is no cell site available to accept/receive the signal, network

service to the mobile device, will terminate involuntarily. Accordingly, the overlap of coverage is necessary for the signal to transfer from one cell site to another cell site seamlessly and without involuntary termination.

9. A number of factors determine the distance between cell sites, including, but not limited to, topography, physical obstructions, foliage, antenna height, operating frequency and line-of-sight.
10. Based on the radio frequency studies, reports and computer models prepared in connection with this project, it is my professional assertion that there is inadequate network service available to existing and potential T-Mobile customers within the Town of Grafton, especially along this portion of Leland Hill Road, Route 122A / Main Street, Pleasant Street, and surrounding neighborhoods.
11. Based on the radio frequency studies, reports and computer models prepared in connection with this Facility, it is my further professional opinion that T-Mobile would be able to achieve the coverage objective by filling these significant gaps in coverage through the installation of the Facility at the Site.
12. Based on the above-mentioned studies, an installation located on the Site at the proposed height would provide adequate coverage for T-Mobile.
13. The Facility will enhance T-Mobile's ability to provide adequate coverage in the area and will increase its capacity to better serve the residents and businesses around these areas of Grafton and to individuals traveling through these areas.
14. The Facility will be in compliance with the FCC Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation.
15. The Facility will be installed, erected, maintained and used in compliance with all applicable Federal, State and local regulations, including, but not limited to applicable regulations administered by the Federal Aviation Administration, Massachusetts Aeronautics Commission and the FCC.
16. T-Mobile is assigned specific frequencies within which it must operate its facilities. The proposed Facility will not interfere with existing public safety communications systems, television or radio signals.
17. Based upon the best radio frequency technology available at this time, it is my professional opinion that the Facility is at the height necessary to ensure adequate service to area residents and businesses and those traveling within the geographic area described above.

Executed this 17 day of January, 2018.

A handwritten signature in black ink, appearing to read 'Jose Hernandez', is written over a horizontal line.

Jose Hernandez, T-Mobile Radio Frequency Engineer